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MID-TERM EVALUATION
"INTEGRATED PEST MANAGEMENT FOR ANDEAN COMMUNITIES"

(MIPANDES)

(No. 527-0372)

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Acronyms and Abbreviations

CEDEP	Centro de Estudios para el Desarrollo y la Participación, a Peruvian NGO
SENASA	Servicio Nacional de Sanidad Agraria
SERESA	Servicio Regional de Sanidad Agraria
CEPAB	Centro de Producción de Agentes de Control Biológico
CIP	Centro Internacional de la Papa
GIFAP	Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques
INIA	Instituto Nacional de Investigaciones Agrarias
IPM	Integrated Pest Management
MIPANDES	Manejo Integrado de Plagas Para Comunidades Andinas
NGO	Non-Governmental Organization
PRONAMACHCS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos
UNA	Universidad Nacional del Altiplano
USAID	U.S. Agency for International Development

MID TERM EVALUATION OF THE MIPANDES PROJECT

1.0 Executive Summary

The MIPANDES Project was subject to a mid-term evaluation at the end of its first 1.5 years of implementation. In accordance to scope of work guidelines, the evaluation team interviewed, over a two week period, representatives from CARE, CIP, USAID, SENASA, INIA, universities, and other pertinent institutions; visited Project implementation sites in the departments of Puno, Ancash, and Cajamarca, and conducted interviews with CARE regional leaders and extensionists, as well as with numerous participating farmers.

The Project was found, with minor exemptions, to be meeting exceedingly well its targeted objectives and to adequately address each of CARE's six Program Principles. IPM training of CARE extensionists by CIP was successfully completed on schedule. The activity promoting life cycles and pesticide safety training for farmers has progressed rapidly to include most participating communities. This activity has been so successful that it spontaneously led to farmers demand for learning about IPM practices and to the adoption of some of these, ahead of schedule. The number of planned CEPABs was reduced from eight to two, after CARE felt that some of the assumptions underlying the original proposal had changed since the project was designed. It is anticipated that the two CEPABs will be functional and producing by April, 1996.

As an IPM project, MIPANDES features several innovative design and implementation characteristics, which point to a high potential for success:

- The Project is directly addressing major crop pest problems that affect a large portion of Andean inhabitants in Peru. Project efforts are expected to result in improved food security and financial savings through reduced crop losses.
- The Project brings into play the relative strengths of a prestigious technology generation institution, CIP, and CARE's proven extension capabilities, in a unique and synergistic relationship that promises to benefit both institutions, as well as participating farmers.
- MIPANDES' unique design, whereby IPM activities are inserted in a complementary fashion into those of existing host projects, introduce cost-effectiveness and sustainability elements not usually found in comparable projects.
- The CIP-CARE approach to IPM implementation has the potential of becoming a model that could be tried with these and other development institutions, issues and sectors, in Perú and other countries.

This evaluation provides a total of 47 recommendations (pp. 19-27) for CARE's consideration, covering a wide range of issues relating to extensionists IPM capabilities, training and extension materials and methods for farmers, monitoring and impact evaluation methodology, community organization, CEPAB implementation, CARE-CIP relationships, Project implementation issues, and Project sustainability and future expansion.

2.0 Introduction

The Andean region of Perú has long been recognized as the center of origin of the potato, *Solanum tuberosum*. The potato has traditionally been and still is one of the main staple food crop for millions of Andean inhabitants living at elevations ranging from 1,600 to 4,200 m. However, potato production in the Peruvian Andes also ranks among the lowest in the world, averaging 5-15 tons/ha. By contrast, potato yields in some industrialized nations, such as the U.S., go as high as 70 tons/ha. Most farmers in the Project implementation areas produce a single potato crop per year.

A combination of factors account for such low productivity, chief among these are: poor seed quality; poor storage techniques; the vagaries of weather, including the damaging effects of hail and drought; poor soil, lack of access to fertilizers; and a complex of pest organisms that regularly attack the potato plant. Among the more damaging of the latter are several insects that feed on the tubers, both in the field as well as in storage.

MIPANDES was designed to address key pest problems in the Puno, Ancash, Cajamarca, and La Libertad departments. It is implemented through CARE's host Projects ANDES (Cajamarca and La Libertad), CHAVIN (Ancash), WARU WARU and MESA (Puno), targeting for assistance families practicing subsistence agriculture. The MIPANDES Project purpose is, thus, to increase the food security and household income of 3,500 poor rural families in the four Andean departments, through the reduction of physical and monetary crop losses due to the Andean potato weevil and the potato tuber moth.

The Project strategy for achieving its objectives includes teaching farmers to recognize the life cycles of the target pest, teaching farmers the basic aspect of pesticide management and safety, introducing IPM practices developed by CIP as a menu of potential options, and assisting with the development of the managerial and technical skills needed for the commercial propagation of biological control agents by community-run micro-enterprises.

The MIPANDES Project brings into play a unique partnership between a prestigious technology-generating institution, the International Potato Center (CIP) and CARE, an NGO with proven extension capabilities. A previous version of the Project proposal prepared by CIP in 1992 was unsuccessful in securing funding from USAID. After being redesigned by CARE and CIP, the Project was approved in its present form by USAID and began implementation in September, 1993.

3.0 Purpose and Methodology of the Evaluation

The purpose of the present mid-term evaluation is to assess the progress of MIPANDES in achieving its intended outputs and objectives at the end of the first 1.5 years of implementation, estimate the Project's potential impact on target communities, and recommend modifications in design and implementation to ensure that the Project will achieve its intended goals and have a positive impact in the target communities.

The evaluation methodology was based on document reviews, interviews with representatives of CARE, CIP, USAID, SENASA, INIA, universities, and other relevant institutions; field site visits; field observations; and interviews with CARE regional leaders, CARE extensionists, and participating farmers.

4.0 Relationship of MIPANDES to CARE's Program Principles

The MIPANDES Project adequately addresses each of CARE's Program Principles:

- **Addressing Significant Problems:** MIPANDES is designed to provide immediate and long-term answers to food crop and monetary losses chronically experienced by poor Andean families. The Project directly addresses income generation and food security concerns, while indirectly addressing environmental and health issues.
- **Working with Poor People:** The Project is designed to focus its efforts on some of the poorest Andean families practicing subsistence farming in areas where agriculture is constantly exposed to the uncertainty of potentially damaging climatic (drought), weather (hail), and biotic (pests) factors.
- **Participation:** MIPANDES is implemented with the active participation of beneficiary families in all aspects of project activities. Families participate in the design and implementation of training and extension programs. The Project's IPM menu is designed to encourage decision making, as farmers select when, how, and which blend of IPM practices to adopt. MIPANDES host projects encourage the development of community organization and management skills, which will represent the basis for the proposed community-managed production centers for biological control agents (CEPABs).
- **Adaptability:** The Project promises to become a model that could be replicated and adapted elsewhere, where comparable conditions might exist. This model may be applicable not only to the implementation of IPM programs for other crops, in Perú or in other countries, but also to other developmental sectors and issues. Training and extension methodologies and materials developed, validated, and applied by MIPANDES may be used by other institutions interested in extending IPM to other regions.

- **Sustainability:** Most of the MIPANDES interventions have a high sustainability potential. Those IPM practices tried and proven cost-effective by farmers will probably become permanently incorporated into their overall crop management practices. The knowledge acquired on pest biology and pesticide safety issues will, likewise, be internalized to a large extent. However, it will be highly desirable that CARE continues selectively reinforcing the adoption of IPM concepts and practices beyond its present three year life to ensure long-lasting results and to continue to develop and expand its emerging role as a center of expertise in the transfer of IPM technology to subsistence farmers. Thus, CARE should consider extending the life of MIPANDES for at least two more years to consolidate the gains and experiences of its first three years, to continue perfecting its training and extension methodologies, to further strengthen the IPM expertise of its extensionists, and to capitalize on the projects' experience by reaching more families through other institutions or by applying it to other key crop protection problems.
- **Fundamental Change:** Project activities are fostering empowerment through new knowledge regarding pest problems, available solutions through IPM, and the economic, health, and environmental implications of using pesticides. Empowerment is also encouraged through greater opportunity in decision making involving crop management and through an enhanced capacity for organization and income-generation.

5.0 Findings and Conclusions

During its first 1.5 years of implementation, the Project strategy called for introducing beneficiary farmers to the basics of potato weevil and tuber moth life cycles and the concepts and application of appropriate pesticide management and safety. The introduction of IPM practices, initially planned for the second year, was spontaneously initiated in many instances. Due to farmers interest and the enthusiasm of Project extensionists, these two sets of activities overlapped somewhat during its first phase.

5.1 IPM Technology: Knowledge, Perception, and Adoption

MIPANDES' IPM practices, developed and tested by CIP and promoted by CARE with CIP's assistance are based mainly on the implementation of cultural control practices and are designed to take advantage of the weak links in the target pests' life cycles. Presented to farmers as a menu-style set of options, this innovative IPM approach is designed to fit naturally and in a nondisruptive fashion within the assortment of crop production practices normally applied by farmers, while minimizing the use of pesticides. In addition to ten cultural control practices (see section 5.1.3), MIPANDES' IPM menu includes the use of biological control and the application of low-toxicity pesticides when absolutely necessary. Thus, in correct and fitting agreement with fundamental Integrated Pest Management principles, MIPANDES' IPM approach seeks to integrate various IPM techniques (cultural, biological, and chemical) to manage the key insect pests of a crop. Adding to its target pests

other major pest problems, such as the more serious diseases and weeds, would bring this MIPANDES one step closer to the ideal IPM intervention.

5.1.1 Pest Problems and Crop Losses in Project Implementation Areas

The main insect pests of potatoes in the Andean highlands, including the Project implementation area, are the Andean weevil: *Premnotrypes latithorax*, *P. vorax*, and *P. sutuicallus* (Coleoptera: Curculionidae), which in their larval stage feed on the tuber; the potato tuber moth (also known in the scientific literature as potato tuberworm), *Phthorimaea operculella* and *Symmetrischema plaesiosema* (Lepidoptera: Gelechiidae), which in their larval stage also attack the tubers; and flea beetles, *Epitrix* spp. (Coleoptera: Chrysomelidae), which feed on the foliage of potato plants. Minor soil pests of potatoes include cutworms (Lepidoptera: Noctuidae), whitegrubs (Coleoptera: Scarabaeidae), and wireworms (Coleoptera: Elateridae).

In general, the Andean weevil is reported to be prevalent at elevations above 3,200 m and both species of the potato tuber moth mainly at elevations below 2,800 m, although both weevil and moth are also common within the 2,800 - 3,200 m elevation range. In practice, these ranges are not so clear-cut, as local climatic and ecological conditions seem to significantly influence their distribution. Except for the fungus *Beauveria brongniartii*, the Andean weevil has no known effective natural enemies. On the other hand, several parasitic wasps attack the tuber moth, although their combined impact may be relatively minor in terms of preventing crop losses. A locally available strain of baculovirus is effective against *Phthorimaea*, but not against *Symmetrischema*.

Among the plant diseases that affect potatoes in Project implementation areas, the potato late blight (rancha), caused by the fungus *Phytophthora infestans*, appears to be the more severe and may be responsible for up to 60-80% of crop losses during unusually wet years. Other diseases reported in these areas result in losses of up to 30% and include viral infections; bacterial wilt, *Pseudomonas solanacearum*; *Fusarium* and *Verticillium* wilt; and bacterial rot, *Erwinia* sp. In Ancash, potato crop losses due to *Phytophthora* is said to average 10-15%. There is a need for a comprehensive diagnosis of plant diseases and resulting crop losses in these regions.

The Andean weevil seems to be the major pest problem in the Puno area, followed by the tuber moth. In Ancash, the weevil is the main tuber pest in the field, although the moth is perceived by farmers as a major problem for stored potatoes, since infested tubers are bitter and unpalatable. In contrast, weevil-infested tubers, once cleaned reportedly retain an acceptable flavor. The information obtained from crop protectionists interviewed in Lima and in project implementation areas regarding the relative abundance and dominance of the two species of tuber moth at various elevations and locations indicated that there may be a great deal of variation in species composition from region to region. In general *Symmetrischema plaesiosema* is more prevalent at higher elevations and cooler temperatures than *Phthorimaea operculella*, although sometimes both species coexist. As ambient

temperature increases, *P. operculella* becomes the more abundant of the two. Indeed, *P. operculella* is found in the potato producing regions of Central America, alongside another species of tuber moth, *Tesia solanivora*. However, in Puno's altiplano, in spite of its high altitude (3,700-3,800 m), this relationship is reversed as *P. operculella* is the dominant species and *S. plaesiosema* is uncommon. This atypical ratio is attributed by CIP and local CARE personnel to the attenuating effect produced by Lake Titicaca on the surrounding ambient temperature, which favors *P. operculella* over *S. plaesiosema*.

In Puno, estimates of weevil-induced potato yield losses range from 30% in Project areas to up to 90% in communities outside the Project's influence. Estimates for weevil-related crop losses may be as low as 2-10% in Ancash. Estimates of losses (mainly to stored potatoes) caused by the potato tuber moth were not available.

5.1.2 Farmers' Perception and Understanding of Pest Biology

Most participating community members seem to have acquired a good working knowledge of the life cycle of both pests and are keenly aware of the relevance of such knowledge to the application of adequate IPM strategies. It is also apparent that before the intervention of MIPANDES, farmers did not associate the damaging larval stages with the adult stages of the same species. Without exception, farmers interviewed stated that, before being exposed to MIPANDES training, they had no idea where weevil larvae came from, concluding that these simply appeared with the hail or speculating that some locally common flies might be the adults.

Failure to associate adult and larva in the past may be partially explained by the fact that weevils are nocturnal, feeding on potato foliage after dark, where they are beyond farmers scrutiny. In the daytime, the weevils, which have a rather cryptic (grayish-brown) coloration and form, seek protection in the soil, where they remain unnoticed. It was not until they visited potato parcels at night to observe the adults feeding on the foliage, studied the various training materials, and observed live "evidence" of these biological relationships that they became fully convinced. Some farmers expressed that when this information is communicated to fellow farmers not currently assisted by MIPANDES, the latter invariably respond with skepticism.

5.1.3 Farmers' Understanding and Adoption of IPM Practices

Based on CIP's IPM philosophy and CARE's approach to development and adherence to its Pesticide Policy, MIPANDES is promoting relatively simple pest management practices. Most farmers can list and explain most IPM practices promoted, acknowledging that, although some of these were already vaguely known, the Project introduced a clear understanding of how the various elements work and how they fit together in the IPM menu.

With barely 1.5 years of Project implementation, it is too early to assess Project impact. However, results to date are promising and indicate that there will be a significant

adoption rate for at least some of the IPM practices, which include: 1) night collection of adult weevils; 2) harvesting on a piece of canvas, followed by a few hours of exposure to sunlight to encourage larva emergence and, whenever possible, using chickens to feed on the exposed larvae; 3) breaking the ground where harvested potatoes were temporarily stored to destroy buried larvae and pupae; 4) moving soil over the base of the potato plants ("aporque alto") to protect the tubers against burying weevil and tuber moth larvae; 5) post-harvest tillage of entire parcel to expose larvae and pupae; 6) elimination of infested potatoes (sanitation); 7) the use of live barriers; 8) use of water-filled ditches as barriers around plots (a natural occurrence under the Waru Waru system); 9) crop rotation; 10) destruction of volunteer plants; 11) application of microbial agents; and 12) application of some low-toxicity insecticides, only when absolutely necessary.

Most farmers are already applying at least some of these practices. The first three or four of these are among those mentioned more frequently. On the other hand, most farmers resist practices such as digging around seeded plots and planting live barriers of crops such as *Lupinus sp.*, which require high labor inputs and, to a lesser degree, the elimination of volunteer potato plants, which provide off-season food for rural families. For instance, in the case of the WARU WARU Project, as of March 1995, almost 100% of families practiced the night weevil removal and the harvest/temporary storage on plastic sheets (to induce larva emergence) techniques. About 70-80% of farmers have ceased to apply the insecticides Aldrin and Tamaron (methamidophos), while about 60% of them are eliminating volunteer potato plants. On the other hand, less than 20% construct ditches (which when filled with water act as barriers for incoming weevils) and less than 30% plant live barriers around their potato parcels. This pattern is probably typical of most communities participating in MIPANDES.

Adoption of IPM practices in family plots is lagging in implementation as compared with the community managed areas, where the project is demonstrating most of the technologies. In some areas managed under IPM guidelines, crop losses are reported to be 30-60% less than in traditionally managed plots. Some community members claim that weevil-induced crop losses are decreasing as a result of the IPM practices adopted.

5.1.4 Farmers Understanding and Adoption of Safe Pesticide Use Practices

In the past, local farmers have often relied on chemicals for the control of potato pests. Products such as Aldrin and Parathion are still common in Puno, while Tamaron (methamidophos), Furadan (carbofuran) and Metasystox (demeton-S-methyl) are common in Ancash. Even before the introduction of MIPANDES, CARE projects in the area have supported the move from the more toxic pesticides to the less toxic ones, such as Ambush (permethrin), Sevin (carbaryl), Lorsban (chlorpyrifos), Sherpa (cypermethrin) and Alsystin (triflumuron). Some farmers have traditionally also used ash and lime (cal) for insect and disease control.

In its effort to introduce safer and more environmentally sound pesticide use practices, MIPANDES is promoting the adoption of GIFAP's eight "golden rules" for the handling, application, storage, and disposal of pesticides. Most participating farmers can readily explain these rules, including the relationship of the four pesticide label color codes and relative product toxicity, intoxication risks, some symptoms of organophosphate/carbamate pesticide poisoning, what to do if accidentally exposed to pesticides, the basics of protective clothing when applying pesticides, and safety precautions regarding pesticide storage and container disposal. The need to promote these practices is highlighted by the fact that farmers in these parts have no access to qualified information or guidance regarding pesticide selection and use, and must therefore rely on the unqualified recommendations of local vendors and on the advice of other farmers.

Although pesticide application activities were not observed, as the evaluation coincided with the potato harvest season, the evaluation team is satisfied that as a result of Project training, most community members are now aware of the risks associated with pesticide use and of the basic precautions required when handling them.

5.1.5 Suitability of IPM Practices to Socio-Cultural and Agroecological Characteristics of Project Implementation Areas

The IPM practices that are being promoted by MIPANDES are attuned to the socioeconomic and agroecological conditions that characterize the Project intervention areas, reflecting CARE's long-term approaches to project implementation. Most of these are relatively simple cultural practices that can be readily incorporated into farmers' other crop production activities. Some of the practices previously promoted by CARE host projects, such as the use of diffuse light storage facilities for potatoes, directly contribute to the sustainable management of pest insects. These practices have been supported by the various CARE projects for seed potatoes at the community level and are now being applied to potatoes destined for family consumption, as a means to help improve household food security.

5.1.6 Progress Toward Achieving Project Objectives

Except for the implementation of the planned CEPABs, progress towards achieving Project objectives is on target. The activity that promotes farmers' learning of the pests' biological cycle advanced rapidly to include up to five, instead of one community per extensionist, as had been planned originally. The training program, which included a variety of live demonstrations, naturally and spontaneously led to the learning and adoption of several IPM practices, even though their promotion was originally scheduled to begin at the end of the first 1.5 years of the Project.

At the time of this evaluation, 57 MIPANDES extensionists had received short-term training in IPM from CIP specialists, exceeding its LOP planned target of 52. MIPANDES extensionist, in turn, have trained over 3,800 smallholder farmers in pest biology and

recognition, also exceeding the expected 3,500 targeted, while about 2,000 of them (57% of the 3,500 targeted) have been also trained in the application of IPM practices, including safe pesticide use. These figures reflect the project's plans to first complete pest biology training before embarking on IPM training during its second 1.5 years.

The number of planned CEPABs has been reduced from eight to two. The establishment of the two biocontrol microenterprises, as well as the training of community members in the propagation of biocontrol agents, is expected to begin in late 1995.

Over 50% of the training and extension materials planned during the LOP have been developed, validated, and distributed to participating farmers. Two high quality videos, one on the Andean weevil and the other on the tuber moth, both focussing on the pests' life cycles and their interaction with the potato plant, have been produced and are being used in training programs. A third video on the successful weevil collection contest and field day, organized by the Cajamarca region, has been produced and, after some editing, has a high potential for use in project promotion and training activities. Two posters illustrating the life cycle of the Andean weevil and the tuber moth have been developed, validated, and distributed. Two more posters, depicting IPM approaches for the weevil and the tuber moth are being validated, and soon will be printed. Two brochures (plegables) addressing the life cycles of the weevil and the tuber moth have also been produced and distributed. A poster, a brochure, and a set of audio messages for broadcasting in local radio stations, all addressing safe pesticide use practices, have been produced, validated, and distributed.

5.2 Training and Extension

5.2.1 Technical Competence of MIPANDES Extensionist

The MIPANDES Project is implemented through 39 extensionists who work for host CARE projects, distributed as follows: Puno (16), Cajamarca (8), La Libertad (6), and Ancash (9). The extensionists are medium level and B.S. level agronomists (Ingenieros Agrónomos), most of whom are experienced, knowledgeable, and enthusiastic. Most of them also perceive IPM-related work as complementary to their other duties and activities and recognize and appreciate the usefulness of IPM as a integral component of crop production activities.

As a group, the MIPANDES extensionists still need additional training in various IPM areas, such as the recognition and management of potato diseases, a more thorough understanding of the more common insects associated with the potato crop (including soil inhabiting species, minor pests, and predatory and parasitic species), and the management of microbiological control agents. In the field, extensionists have access to a few technical documents, but lack several reference literature, which should be relatively easy to obtain.

An introductory five day course in IPM, emphasizing potato pests, was presented to 60 CARE participants over a two week period. This first IPM course, presented at the CIP

facilities, was adequate, motivated CARE and CIP personnel, and provided ground for discussion and adoption of a common training methodology. Training materials consisted mainly of pamphlets article reprints, and related literature, in addition to slides, as CIP does not have a standard IPM training manual. The second introductory course, however, has been criticized by some of the participants for being too short and for not covering some topics in sufficient detail, such as biocontrol. There has been no follow up on the training provided thus far.

5.2.2 Training Objectives and Methods

Most community members interviewed recognized the value of Project printed materials for learning about pest biology. Live experiences, such as field collecting and rearing insects in pots, suggested by the extensionists, were however identified as the best and most convincing means of learning about the life cycles of pests.

Although initiated very recently, the radio messages on pesticide purchase, handling, storage and application are generally known and understood by many farmers. In some areas, households not included as direct Project beneficiaries have been reached by the radio messages, and farmers report that they are following the recommendations.

In some areas, the Project has already began promoting the exchange of experiences among communities and community members in relation to life cycles and IPM practices for potato weevil and tuber moth.

5.2.3 Extension Objectives and Methods

Each MIPANDES extensionist works with 6-8 communities collaborating with a host project, although, in theory, MIPANDES activities are intended to be implemented in only 3-4 of them. Because of community demands and pressing pest problems, more communities are involved in MIPANDES than originally planned. At present, MIPANDES activities take up approximately 25-30% of the extensionist's time.

MIPANDES's extension system is based on community work: community training and field demonstration of practices in the communal land, or in an individual plot whenever communal land is unavailable. Follow-up activities take place at the individual family unit, with up to 10 individual plots selected by each extensionist to monitor adoption of IPM practices. The individual follow-up of training and field demonstration has not been adequate, in part due to the high work load of the extensionists, but also because the project has not specifically promoted the replication of IPM practices in individual plots.

5.2.4 Training and Extension Materials

During the relatively short life of the Project, CARE in collaboration with CIP have produced a variety of high quality and useful training materials, including posters, brochures,

insect display boxes, slide sets, and videos. CARE should be commended for its openness to share these materials, as well as its training courses, with other governmental and nongovernmental organizations in Peru.

CARE has developed an innovative methodology for validating IPM training and communication materials, which includes the technical review and backstopping by CIP and consultation with participating communities. Although on the right track, the validation process imposes on farmers materials previously developed and only considers their opinions on terminology and format. Moreover, some extensionists feel that their opinions were not taken into full consideration during the validation process.

Excessive information in some of the materials developed by MIPANDES may affect the clarity of their messages. For example, the poster depicting the life cycle for the potato weevil has too many pictures and the potato plant illustration in the background distracts the attention of the reader. This poster does not properly relate insect life cycle to that of the potato plant, either. The brochures have too much written information for audiences that are not usually fully literate, and its unusual design confuses readers who expect a conventional orderly sequence of events. It takes rather a long time for a community member to go through one of the brochures, suggesting lack of familiarity with their use. The posters are displayed in most community buildings, although sometimes they are found in less accessible locations. Some of the brochures were observed tacked to walls, as posters.

The weevil and tuber moth life cycle videos produced by MIPANDES are of excellent quality and represent a valuable training resource. Their images, script, text, information, background music, and sound are especially good. The weevil video is especially impacting.

The project has also developed a locally adapted poster, based on GIFAP's "eight golden rules" pertaining to safe pesticide use. This poster is being displayed on the walls of most potato storage facilities and community buildings. The structure of the "golden rules" brochure is different from those addressing pests' life cycles. This lack of consistency will have the effect of confusing the users on how to follow the text. Radio messages are being broadcasted in local stations to educate farmers in proper pesticide management practices.

Because training materials were developed late in the Project start-up phase, extensionists were stimulated into designing and using their own training and communication materials. This promoted creativity and new teaching methods, including the use of simple and effective posters and games designed to explain life cycles. When first distributed, the printed materials were in short supply and did not reach all project beneficiaries, which further stimulated the use of locally-produced materials. The local materials are quite simple in design, and community members seem to relate better to them than to the posters developed in Lima.

5.3 Community Organization

MIPANDES host projects (ANDES, CHAVIN, WARU WARU and MESA) collaborate with groups of individuals organized into so-called operative units. These are constituted by individual small holder farmers living in a village (Cajamarca and La Libertad) or by farm communities or their sectors (Ancash and Puno), which already have an existing organization and a local government. These organization may take various forms, depending on regional and cultural characteristics, such as groups of small producers (Cajamarca and La Libertad), communities or community sectors (Puno and Ancash), farmers associations (Ancash), and mothers clubs (Ancash). CARE does not seek to create parallel organizations, but rather to strengthen their production techniques and community management and entrepreneurial skills.

Community organization under the CARE projects have three major objectives: a) generate revolving community funds to generate surplus funds, b) use surplus funds for food security purposes (WARU WARU, MESA) and to reinvest surpluses to generate capital for the producers committees (CHAVIN, ANDES), and c) provide training to families in appropriate production and marketing techniques and entrepreneurial skills.

The evaluation team visited and interviewed the following groups in Puno: S.J. Ullagachi (community sector), S.J. Llunco (community sector), Jilamaico (community sector), Choque ("parcialidad"), Cutipa Chillerota (community), Huata-Quita (community sector), Tupac Amaru ("parcialidad"). In Cajamarca the following small producers groups were visited: Sogorón Alto, Yerba Buena, Chagmapampa, Chim Chim y Luichopucro. In Ancash, the following organizations were visited: Club de Madres Luz Divina de Achic, Comité de Productores Agropecuarios de Cachipucro, Comité de Productores Agropecuarios de Yanacoshca y Empresa Comunal San Miguel de Collahuasi.

The size of organized groups participating in MIPANDES vary with the area: between 18 and 51 families in Ancash; 15-40 families in Cajamarca; 23-44 in La Libertad; and 25-125 in Puno, where population density is higher than other areas.

The projects visited promote the adoption of an organized approach to the rational management of the resource base and the adoption of the entrepreneurial performance, such as the sharing of risks and results and the management of community funds as operating capital for the group.

Depending on the project's nature, CARE intervenes with a combination of the following activities for the organization: financing for crops and livestock (community funds), productive infrastructure (Waru Warus reconstruction, diffuse light warehouses, small irrigation systems, greenhouses) and training/technical assistance (crop production, IPM, entrepreneurial skills).

The rationale for working with organized groups includes: a) economy of scale

considerations in the management of resources, mainly the land; b) re-assessment of the tradition of reciprocal work ("minga") as an alternative to labor force scarcity; c) more effective access to fixed assets, such as backpack sprayers, livestock, and warehouses; d) improved negotiation position in commercial interactions; e) improved cost-effectiveness of Project activities, as extensionists can arrange their visits to coincide with group work days, thus reaching more farmers than it would be possible if exchanges were to be on an individual basis; f) improved conditions for negotiating with other institutions; g) foster solidarity among members.

Generally, participating groups organize themselves through a general assembly of community members, a board of directors, and special committees for agriculture, livestock production, water and irrigation, community infrastructure, agroforestry, forestry, education, social services, mothers clubs, sports, trade, youth, health, and security, each of which has an elected president. The president of the agriculture committee often also functions as the agricultural promoter.

Within the context of this organization, community resources and work are assigned through the assembly, which is constituted by the household heads, both male and female. Community projects and work are discussed and agreed upon in assemblies. This group decision making process is key to the success of development activities and is highly regarded by farmers participating in CARE projects in Puno, Cajamarca, and Ancash as an efficient means for accomplishing and sustaining their common goals.

In communities where only a few families join groups, e.g. Cajamarca, there is a risk that their members may become an elite group within their community. However, those interviewed not only did not discriminate against nonmembers, but rather showed solidarity towards all their neighbors.

This level of organization has encouraged farmers acceptance of new initiatives, such as IPM, perceived as being favorable to the management of natural resources. Groups interviewed in Cajamarca and Puno commented that IPM benefits crop yields, hence also the community funds. In addition, the operation of communal parcels facilitates the implementation of IPM practices, while enhancing the cost-effectiveness of large-scale demonstration, training and technical assistance activities, as many farmers can be readily located working in the same plot. IPM practices promoted by MIPANDES' have a greater potential for adoption and replicability when farmers groups are allowed to validate them.

Within the context of existing farmers organizations, the proposed community-managed production centers for biological control agents (CEPABs) will be new activities that will join others already managed by communities participating in CARE projects. In this regard, the establishment of a CEPAB should be based on the presence of a strong community organization, experience in the distribution of surpluses, and experience in production and marketing. The Waru Warus communities in Puno seem to be close to meeting these requirements, while those in Ancash are still to be identified.

5.4 CEPABs: Technical and Economic Soundness

The original Project Proposal for MIPANDES anticipated the creation of eight centers for the production of biological control agents (CEPABs), specifically targeting the production of a baculovirus that is effective against the larval stage of the potato tuber moth, the fungus *Beauveria brongniartii*, which is effective against immature stages of the Andean weevil, and *Copidosoma koehleri* (Hymenoptera: Encyrtidae), a parasitic wasp that attacks tuber moth larvae.

MIPANDES recently proposed to reduce from eight to two the initial number of CEPABs targeted for installation. The reasons for the proposed reduction were: a) the newly perceived risk of biological contamination of the *Beauveria* fungus associated with community-run commercial production operations, which may affect its effectiveness; and b) a recent Ministry of Agriculture initiative, through its Servicio Nacional de Sanidad Agropecuaria (SENASA), calling for the installation of up to 25 laboratories for the production of microbiological control agents and up to 60 insectaries for the rearing of insect parasitoids, in various potato-growing regions of Peru. The proposed reduction of the MIPANDES's CEPABs anticipates that two CEPABs should produce as much as the eight originally planned.

Within CIP, and the scientific community in general, the feasibility of rural community-based commercial production of microbiological control agents, such as the fungus *Beauveria* is being debated. It is becoming evident that it will be difficult to produce the fungus commercially, under the proposed conditions, without a certain degree of biological contamination. A 10% minimum acceptable contamination level for *Beauveria* in its saprophytic stage has been suggested.

In addition, different stakeholders involved in MIPANDES appear to have different views on the relative role of laboratory - produced biological control agents on the IPM program. Some may erroneously believe that the blend of biocontrol agents targeted are essential for the success of the IPM program, rather than complementary techniques, as is the case.

In late 1994, SENASA began to implement a plan to create a network of 60 insectaries and 25 entomopathogen laboratories for the commercial production of biological control agents. The cost of outfitting the latter is estimated at U.S. \$12,000. These facilities are to be operated under joint-venture type agreements between SENASA or the Servicio Regional de Sanidad Agraria (SERESA) and universities, farmers associations, or the Instituto Nacional de Investigaciones Agrarias (INIA). Through these agreements, SENASA contributes equipment, start-up materials, and technical assistance, while the partner institution contributes infrastructure and labor. Several of these facilities are being established in the project area (Puno, Ancash, and Cajamarca) and some are already producing the fungus *Beauveria*, baculovirus, and the parasitoid *Copidosoma koehleri*. SERESA is acting in some areas through the recently created Agricultural Health Committees

(COSAGRAs).

In Puno, SERESA has entered into separate agreements with INIA and the Universidad Nacional del Altiplano (UNA). Under this agreement, the UNA facilities are expected to produce 80 kg of baculovirus, 80 kg of *Beauveria*, and 100,000 *Copidosoma* wasps. However, the UNA insectary is only maintaining a relatively small stock colony of the parasitoid and has not yet begun to produce neither virus nor fungus. Likewise, the INIA facilities are also rearing *Copidosoma*, but have not begun production of the entomopathogens.

In Ancash, the Centro de Estudios para el Desarrollo y la Participación (CEDEP), a local NGO which is rearing and releasing biological control agents and is interested in coordinating with CARE, claims that *Copidosoma* is easily established in the field. CEDEP, which is testing IPM practices for the control of the corn insect pest *Heliothis* sp. (Lepidoptera: Noctuidae) and the potato tuber moth, is rearing and releasing *Copidosoma* wasps against tuber moth under both field and warehouse condition. Although CEDEP is reporting rates of 500 parasitized larvae per hectare and 100 per ton of potatoes, no information was provided on what this will mean in terms of crop loss reduction. CEDEP also plans to establish facilities for the production and sale of *Beauveria*.

Finally, in Cajamarca, a SERESA facility has been producing baculovirus for some time. The idea for the nationwide network of biocontrol centers may have originated here. This year the facility has produced 500 kg of a talcum formulation of the virus. Current plans call for reaching a production of 10 tons by the end of the year. The cost of producing one kilogram of formulated product is estimated at S/.2.60, while the sale price is S/.5.00/kg. SERESA plans to begin production of *Beauveria* soon, with a targeted production of 45 kg initially and plans to reach 2,000 kg. At the same time, with SENASA support (its contribution amounts to U.S. \$4,000), INIA is in the process of outfitting its own production facilities.

As far as it could be determined, no supply/demand, socio-economic, production, distribution, or marketing studies have been conducted in preparation for implementing the SENASA program. There are no plans to develop the demand for these biocontrol products at the farmers' level through training or technical assistance activities, either.

Although it is being reared in various insectaries throughout Perú, the strategic use of *Copidosoma* parasitoids for the control of the tuber moth is still under discussion. CIP has not confirmed that the cost and effort required to rear this parasitoid for field releases is justified by a significant increase in moth mortality and reduction in crop losses. CIP will continue its research into the efficacy of the parasitoid.

There seems to be limited information on the natural distribution of *Copidosoma koehleri* in Perú. Although this wasp may be responsible for up to 70% parasitism of tuber moth larvae in some locations, it is unclear precisely how the parasitoid is to be used:

whether for introduction and establishment; for inoculative releases to periodically boost its populations; or for inundative releases to directly induce mortality on the host pest, in a manner similar to utilizing a microbiological control agent. If the parasitoid is already present throughout the Peruvian Andes, its rearing for introduction and establishment is justified only if it is known to be absent from specific areas. If the purpose is to boost up local populations through periodic inoculative releases, information should be produced on the relationship between number of parasitoids released, expected parasitization rates, impact on moth populations, and what this may represent in terms of actual pest control, as reflected in decreased crop damage. Likewise, its mass rearing for inundative releases (as is done with *Trichogramma*) would be justifiable only on the basis of well-documented technical and cost-effectiveness studies.

At present, there is no reliable information on production costs, market-driven demand, distribution needs and mechanism, or socio-economic issues on which to base a proposal for a CEPAB enterprise. However, in contrast to other initiatives, MIPANDES is creating its own demand for these agents by fostering the adoption of IPM practices, including the use of biocontrol techniques as one of the elements in the menu of IPM practices offered. MIPANDES host Projects have been working on community organization for several years with various degrees of success. Some of these organizations have already reached the level of commercial enterprises, targeting the production and marketing of agricultural products and derivatives. The proposed CEPABs would fit very well into this scheme.

There are some reports suggesting that baculovirus received from CIP may not be performing as expected, both in laboratory as well as in field tests. Although there are several factors, unrelated to baculovirus effectiveness, that may have contributed to these reports, it would be advisable to rule out the possibility that the effectiveness of the virus preparation itself may be implicated.

5.5 CARE-CIP Relationships

CIP and CARE have developed a highly productive relationship based on complementary skills and missions. Personnel from CIP and CARE recognize that the "joint venture" is beneficial for both institutions since it is based on their respective competitive advantages. CIP benefits from CARE's extension capabilities and the latter has access to updated and "cutting edge" technology to promote agricultural development. CIP is presently engaged in several other "joint ventures" with NGOs, although most of them are with smaller organizations and none of them has a binding contract, such as the one with CARE.

There are no formal managerial or technical mechanisms for decision making, consultations, and other exchanges between CIP and CARE. An advantage of this approach is the resulting flexibility for management decisions. A disadvantage is that institutional relations rest on the individual relations between CARE's ANR Sector Manager and CIP's

IPM Program Leader.

Professional relationships are excellent, and both institutions seem to feel satisfied with their collaborative work. CARE's extensionists appreciate their visits to CIP, for training purposes and the technical backstopping provided by CIP personnel. The latter, in turn, appreciate that their technology generation efforts are reaching the farmers and welcome the feedback that they receive from the technology users.

CIP personnel visit each field site three to four times a year, but their level of interaction with CARE's field staff is variable. Some of the visits are perceived by some extensionists as monitoring or supervisory in nature, rather than as technical support. There are no technical meetings conducted after field visits or trip reports produced. According to CARE, CIP is meeting about 80% of its Project commitments. CIP's IPM team has worldwide commitments and must provide technical assistance to potato and sweet potato production programs in various countries. At present, the CIP team has reached its maximum capacity for providing support to the MIPANDES Project. It is not known how much of the MIPANDES contribution to CIP (ca. U.S. \$26,000/year) actually benefits the IPM group. Because of its control of the MIPANDES budget and its commitments and responsibilities to the donor, CARE is seen as the proprietor of the MIPANDES project. This fact is recognized and accepted by CIP personnel.

Recently, all CIP programs underwent one of its periodic external evaluations. The draft evaluation report suggests that the Center should concentrate more on research and be less concerned with technology transfer. This suggestion does not seem to carry much weight among the CIP personnel interviewed, who continue to appreciate CIP's new outreach role and capabilities, made possible by the joint venture with CARE.

5.6 Women Participation

Women participation in MIPANDES activities was apparent in all communities visited by the evaluation team, although at times their visibility was somewhat low during interviews. Women knowledge and appreciation of pests life cycle, safe pesticide use practices, and IPM techniques was evident. Women appear to be more sensitive to health issues, such as the possible implications of pesticide residues in stored potatoes. In two WARU WARU Project communities, for instance, when interviewed in their native language, women readily demonstrated their knowledge of these topics. In this project, women accounted for 39% of participants in training activities. In Ancash, where women represented 31% of participants in MIPANDES activities, gender issues are beginning to be addressed by extensionists, who recently attended a seminar on the role of women in agricultural development. Women participation in MIPANDES training and field demonstration activities is about 22-24% in Cajamarca. On the average, then, women participation in MIPANDES training activities accounts for about one-third of the total.

5.7 MIPANDES Implementation and Relationships with other CARE Projects

In general, project implementation is proceeding according to plan. Some delays could be noticed in Ancash where personnel turn-over has been high and farmers participation has been lower than expected in the past. This factor has affected project personnel morale, to some extent, more than project implementation. At present, however, the project is proceeding suitably and is on schedule.

In the regions where CARE's host projects are active, crop losses due to potato weevil and tuber moth attacks are quite high. Thus, the introduction of MIPANDES activities has filled an existing void in current host projects by directly addressing crop loss issues, which are perceived by farmers as critical to the well being of their families. Due to its overlap with host projects, MIPANDES activities fit neatly into a more comprehensive set of CARE interventions that address crop production, household food security, and community organization. This comprehensive approach has been instrumental in achieving project objectives. Conversely, there is no indication that MIPANDES has negatively affected the implementation of host projects, but rather that it has been strengthened in the process.

MIPANDES has developed a detailed monitoring system and is accumulating detailed information on project implementation, targets, and goals. The information is being analyzed only in terms of its quantitative contribution to achieving Project targets. According to some extensionists, the process of completing the data collection forms is rather cumbersome and time consuming. No computerization of information has been implemented. Some Project teams have developed their own internal evaluation and monitoring system. WARU WARU extensionists hold monthly meetings, where views on project implementation, progress, and problems are shared and discussed. Chavin has recently initiated an in-field monthly evaluation activity where the team analyzes the progress of the best participating community for each extensionist.

The Project's baseline study offers valuable information on potato crop production and protection needs, crop damage levels, farmers pest management knowledge and practices, and the status and cost of chemical pest control at the regional level. However, it contributes little in terms of economic information at the family unit level. Tracking and measuring the economic impact of the IPM program at the household level will require additional evaluation techniques (see 6.1.5 and Appendix 3).

5.8 Potential Impact of MIPANDES on Crop Yield Losses, Pesticide Use, Food Security and Income in Participating Communities

Under subsistence agriculture conditions, potato crop losses due to pest attacks in the Peruvian Andes can be staggering and contribute to yields that may average 5-15 tons/ha, among the lowest in the world. Even in the absence of the Andean weevil and the potato tuber moth, crop losses due to virus infection, poor quality seed, plant diseases, such as late

blight, poor storage practices, and attacks by occasional insect pests, not to mention the effects of drought, hail, and frost, would still inflict damage to this crop, ranging from moderate to severe. Attacks by the Andean weevil and the potato tuber moth account for much of the actual damage regularly inflicted on this crop. In Puno, the evaluation team observed potatoes being harvested in a field outside MIPANDES' area of influence, where weevil infestation was probably in excess of 80%. In Choque, 90% weevil infestation levels were reported. Likewise, farmers in the Jilamayco community reported up to 95% infestation in non-waru waru plots. In Cajamarca, crop losses were less, up to 50% losses to both weevil and tuber moth being reported in Luichopucro.

Much of the potato crop losses, due weevil and tuber moth attacks, experienced by farmers not exposed to IPM practices, are preventable. In the past, Andean farmers have contributed to the high infestation problem by planting year after year in plots infested with these insects and by using control approaches that failed to decrease their populations. The IPM practices promoted by MIPANDES are designed to destroy the different life stages of these insects, and once adopted, will have the immediate effect of reducing weevil and tuber moth populations. The effectiveness of the IPM practices will increase as more and more farmers adopt at least some of the more effective of them. Eventually, if there is widespread IPM adoption over, say, an entire valley or region, each year the planting season will begin with a smaller and readily manageable pest population. Neither insect will be completely eliminated, because IPM adoption by farmers will never be 100%, IPM practices are not designed to eradicate but rather to manage pests, both insects will continue to subsist on alternate host plants, and there will always be new arrivals through migration from other regions.

After 1.5 years of project implementation, some tentative predictions may be advanced regarding the potential impact of three years of MIPANDES on crop losses, pesticide use, food security, or economic gains for beneficiary families. The expected 10% reduction in physical crop losses due to the combined attack of both pests is not only attainable, but will probably be exceeded significantly in fields where at least three or four of the IPM practices are being applied. For instance, although the project is just beginning its IPM transfer program, many farmers are already applying some IPM techniques with, reportedly, positive results. For example, a MIPANDES extensionist reports that the application of *Beauveria* has reduced weevil damage from 65% to 43% in Choque community parcels. It would not be unreasonable to expect that in some plots where a combination of IPM practices are being diligently applied, reduction in target pest damage may exceed 50%.

Since, at present, the high cost of pesticides precludes their overuse by farmers, the impact of MIPANDES in reducing the frequency of pesticide applications for control of the two target pests, will be minimal. More than economic, the impact of MIPANDES will be on the health and environmental consequences of pesticide use, as farmers turn to less toxic products and learn to handle and apply all pesticides safely. In the past, for instance, beneficiary farmers have often applied some highly toxic organophosphate insecticides, such

as parathion, as well as persistent organochlorine products, such as aldrin and endrin. Under MIPANDES guidance, they now apply less toxic and less persistent products such as acephate, carbaryl, chlorpyrifos, and cypermethrin, and soon will be relying more and more on bioinsecticides, like baculovirus and *Beauveria*.

As weevil and tuber moth populations decrease, the net production of undamaged tubers per unit area will increase proportionally. More tubers will mean greater carbohydrate availability to beneficiary families, and the surplus may be used to generate extra income. However, other factors such as low quality seed, losses to viral and fungal diseases, and inadequate fertilization practices will continue to affect the potential yield.

5.9 MIPANDES Sustainability and Future Expansion

MIPANDES sustainability strategy is based on the following three approaches: a) fostering knowledge, specifically the thorough understanding of pests' biological cycles and certain IPM practices; b) building upon familiar practices (e.g. tillage, placing harvested potatoes on a piece of cloth, high "aporque") by demonstrating to the farmers' satisfaction that such practices have definite pest control uses; and c) promoting organization through the activities of CARE's host projects in order to demonstrate the benefits of social control, risk reduction of shared assets, and sound community management of shared resources to generate marketable surplus.

MIPANDES sustainability beyond the end of its third year is assured for at least two more years, through the activities of continuing host projects. However, and in spite of its anticipated gains, three years may not be sufficient for the Project to truly achieve long-term sustainability. It would be highly desirable that MIPANDES, in some form, continues for at least two more years to consolidate, build upon, and expand the achievements of its first three years (see Section 6.8). In addition, because of the high variability of crop/pest interactions and climatic factors that affect Andean agriculture, a project lasting five or more years will have greater chances to encounter and deal with a wider range of such situations

Several factors contribute to enhancing the sustainability potential of the IPM approaches introduced by MIPANDES. The IPM practices promoted are based to a large extent on the crop management knowledge and past experiences of farmers. They are also designed to encourage decision making and the incorporation of IPM into the crop management process. This approach does not depend on external inputs or creates dependency on external technical assistance, either. The climate for the adoption of IPM practices at present is especially favorable in that the high cost of pesticides in relation to farmers' economic means have made their use far less acceptable. Were these conditions to change, the IPM adoption process might be affected.

The Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos (PRONAMACHCS) is the only governmental extension program working with small-medium size Andean farmers. Each extensionist is assigned 5-8 communities, for a total of

about 1600), and work in soil conservation, rural infrastructure, forestry and -- recently -- crop management, including some 3,000 ha of potatoes. The program uses incentives, such as gifts (tools), to encourage farmer participation. Since its strength has traditionally been in soil conservation, PRONAMACHCS has limited technical expertise in crop management. In addition, it has experienced a high turn over of its field staff over the past years. As counterpart to CARE's ALTURA Project, PRONAMACHCS has established working relationships, at both management and field levels, with CARE. MIPANDES personnel is currently engaged in providing IPM training to PRONAMACHCS extensionists working in agriculture, although the success of this program has yet to be demonstrated in terms of farmers' IPM adoption through PRONAMACHCS extensionists. Through cooperative arrangements such as this, CARE may have the opportunity to expand the transfer of IPM to many more families than would be possible through its extension efforts alone. However there are potential risks in this new association. CARE should realize that if this relationship expands, it may create additional demands on its extensionists, who are already working at or near full capacity. Also, since PRONAMACHCS' recent interest in crop management and IPM reflects the policies of the present administration, there is no assurance that this trend will continue under future administrations.

The CIP-CARE joint venture experience is developing into a potentially workable model that could be replicated, under comparable conditions, with other development issues and sectors, in and outside Perú. For instance, it may come handy were the "giant" potato tuber moth, *Tesia* (formerly *Scrobipalopsis*) *solanivora* to reach the Peruvian Andes. This serious Central American potato pest is now in Colombia, and it may be a matter of time before it spreads to Perú.

6.0 RECOMMENDATIONS

6.1 IPM Technology: Knowledge, Perception, and Adoption

6.1.1 Farmers Understanding and Adoption of IPM Practices

- CARE Extensionists need to be reassured that it is not necessary that farmers adopt all or even most of the IPM practices in the menu to have a successful IPM program. The idea is that farmers select from the IPM "toolbox" those techniques that are best suited to local agroecological conditions. Factors such as effectiveness, convenience, and additional effort required, will be weighed by farmers in a process that will be carried out through trial and error. CARE extensionist are in the position to observe the results of applying diverse combinations of IPM techniques and thus to advise farmers as to the more promising combinations under given conditions, thus helping to accelerate the trial and error process.

6.1.2 Farmers Understanding and Adoption of Safe Pesticide Use Practices

- Most participating farmers seldom use pesticides, partially because, at present, these

are prohibitively expensive for them. However, Project staff should be aware that were conditions to change so as to make pesticides more affordable, the temptation to purchase and apply them when confronted with high pest populations or new pest problems will probably increase. MIPANDES extensionists must remain alert to such possibilities in order to encourage farmers' continued adoption of nonchemical IPM approaches.

- MIPANDES extensionist should continue to actively encourage the adoption of safe pesticide management practices, such as appropriate pesticide selection, handling, application, storage, and disposal procedures, including perforating plastic and crushing metal pesticide containers before burying them. Refresher, 4 hour workshops or field days on safe pesticide use practices should be presented annually to all participating farmers.

6.1.3 Suitability of IPM Practices to Socio-Cultural and Agroecological Characteristics of the Project Implementation Areas

- Extensionists should be alert to the relative effectiveness and adoption rates of IPM techniques in the MIPANDES menu, as these undoubtedly will vary in different communities and regions. This information will be useful to modify training and technical assistance activities accordingly and to assist farmers with their decision-making process when selecting a particular menu. CIP staff recommends to target 3-4 of the more effective practices.
- A diagnostic study of potato diseases needs to be conducted in each of CARE's regions so as to clearly identify the key pathogens involved.

6.1.4 Impact of IPM Practices on Crop Losses, Pesticide Use, Food Security, and Income in Participating Communities

- Although it is too early to assess Project impacts, there are some indications that these might be significant. MIPANDES should keep accurate data on crop yield and production costs from representative communities to compare results with available baseline data at the end of the third year. In addition, values obtained should be compared with data from comparable (control) communities not included in MIPANDES. Data gathered at the end of the second year will supply information not available in the original diagnosis. Evaluation of Project impacts should be undertaken using the following two methods: a) "With and without" comparison of results for 10 families participating in MIPANDES and 10 which are not, per each extensionist; b) "Before and after" comparison of impact data collected for 10 families in July, 1995 and at the end of 1996. Refer to Appendix III for more details on how to conduct the impact evaluation assessment.

6.2 Training and Extension

6.2.1 Technical Competence of Project Extensionists

- With CIP collaboration, IPM training should continue to be provided to CARE extensionists. Examples of training subjects include: a) economic thresholds (mainly in relation to *Epitrix* flea beetle management), b) principles and application of microbiological control, emphasizing the production and use of baculovirus and *Beauveria*, c) recognition and management (through cultural practices and tolerant varieties) of potato diseases in the Project area, with emphasis on *Phytophthora*, and d) updated information on general crop protection.
- CARE should organize and conduct a 1-3 day annual workshop for MIPANDES extensionists in order to provide participants with the opportunity to exchange information, share experiences, and learn from each other.
- CARE should strengthen its in-house expertise in IPM by encouraging and supporting the development of these skills in one or two interested and qualified individuals in each region.

6.2.2 IPM Training of CARE Extensionists by CIP

- CIP needs to publish the complete version of the "Facilitator's Guide to the Introductory Course in IPM for Mid-Level Technicians."
- MIPANDES should establish a system for monitoring the progress of training provided to its extensionists. Visiting CIP personnel should keep this in mind and provide feedback on this issue to CARE managers. The exchange of experiences between CIP staff and CARE extensionists, through periodic field meetings, will contribute to improve and standardize training, and should be encouraged.

6.2.3 Training and Extension Methods and Materials

- CIP and CARE should continue to implement and improve their current validation methodology for training materials by including as much as possible extensionists and farmers' opinions in the validation process. For instance, if time permits, posters and brochures may be gradually simplified if the less complex materials prove to be more useful and widely accepted by farmers. The life cycle posters, especially the one on the weevil, could be cleared of superfluous pictures and information, such as the potato illustration on the background. In a future version of the posters, it would be useful to show illustrations of crop stages alongside insect stages. Future editions of the brochures (*plegables*) could be simplified, in both information content and design, since their present folding sequence may be confusing to farmers. Likewise, it will be desirable to test the relative usefulness of using simple, schematic illustrations of

pests' life cycles vs. the materials developed in Lima. The existing materials have already demonstrated their value to MIPANDES and should continued to be used in support of training and extension programs. The preceding suggestions are meant to be considered in the event that MIPANDES elects to produce additional similar training materials in the future.

- In order to avoid that a small sample of monitored families becomes influenced by being repeatedly interviewed, follow up work for individual farmers should be random, and new individuals should be selected every six months or so.
- MIPANDES need to work with community committees to identify means to complement and replicate the work of extensionists. One way of accomplishing this is by identifying interested male and female key community members and training them to enable them to function as IPM "promotores," working in collaboration with CARE extensionists.
- MIPANDES should continue developing innovative and promising training methods, such as the weevil-gathering competition field day that was recently tried in Cajamarca, the use of "sociodramas," and the card game for assembling a pest's life cycle developed by an extensionist in Ancash, which uses cards with pictures on one side and an explanation on the other. The "card game" could be reproduced in plastic-coated cards by the project as a standard training material.
- Field observations, rearing methods, and similar practices involving real life situations are highly effective as training tools for farmers. The life cycle training strategy should emphasize real life experiences and exercises. Training materials should complement this strategy.
- The timing of pesticide management radio messages should coincide with specific activities performed by farmers at that time. For instance, messages on pesticide labels and storage should be aired during the time when farmers are purchasing pesticides, while messages involving precautions on mixing and spraying should be aired at the time when farmers are getting ready to spray their crops.
- Some MIPANDES training materials to be used for Project expansion need to be revised. A strategy for their development should include: 1) designing simple posters to illustrate life cycles, which associate insect stages with crop phenological stages, for use by extensionists in training activities (see posters developed in Puno); 2) reinforcing materials for use at the group level: posters similar to the ones developed for weevil and moth, with the modifications proposed below; 3) reinforcing materials to be used individually or at the family level, such as brochures developed with the modifications described below or calendars that associate insect stages with crop stages and months of the year, for display in farmers homes.

- The following sequence in the use of training materials is suggested: Initially, use simple posters, slides, and live experiences to teach life cycles. Next, use the more complex posters and brochures to reinforce the messages at the community and family levels, respectively. Finally, use the video to review and reinforce information previously transmitted.

6.3 Community Organization

- MIPANDES should continue implementing its strategy geared at working with community organizations, as this approach leads to positive gains in shorter periods.
- The project should continue to validate the social and economic soundness of IPM practices promoted by MIPANDES at the community level, while follow-up activities should be conducted at the household level to assess their suitability to the socio-economic conditions of the family unit.
- With regard to the implementation of MIPANDES' host projects, the business management and technical validation capacity of participating communities needs strengthening at the community level.
- MIPANDES should monitor the adoption of IPM practices at the household level, taking random samples during each crop growth cycle in relation to a single practice, and without including the same household twice in any one sample (see suggested techniques in Appendix 3).

6.4 CEPABs: Technical, Social, and Economic Soundness

- There definitely is a potential market for baculovirus and the fungus *Beauveria brongniartii* in Project implementation areas, much of it resulting from the Project's own efforts aimed at fostering the adoption of IPM practices by potato producers. MIPANDES should proceed with present plans to set up two pilot CEPABs with initial capacities to supply local needs for microbiological control agents and the potential for eventually meeting regional needs.
- The establishment of the CEPABs should be preceded by an economic soundness and marketing study designed to anticipate consumption levels, identify suitable markets and CEPAB sites, and to provide guidance regarding optimum production levels. This study should be based, in part, on an assessment of similar past experiences in Chinchero and Cajamarca. Projections of production levels should include estimates of potato production and anticipated tuber moth and Andean weevil infestations in relation to anticipated baculovirus and *Beauveria* needs and effectiveness under local conditions. It should be kept in mind that demand for these agents is, at present, dependent on MIPANDES's training and technical assistance activities. It is advisable that the anticipated benefits of the planned CEPABs be quantified and described for

potential producers and users.

- The implementation of CEPABs should be based on social control and entrepreneurial capacity. Thus, in selecting the two communities, organizational and management capacity should be evaluated. Evaluation criteria should include: surplus generation history, contribution to community infrastructure (nurseries, warehouses, agricultural and livestock production centers), commercial links, and investment mechanisms.
- Each CEPAB should incorporate a demand-generation strategy, similar to that espoused by MIPANDES, and continue to promote the understanding of pests' life cycles and the adoption of IPM practices, including the application of microbiological control techniques.
- The production costs for both biocontrol agents should be reassessed, taking into account the rural micro-enterprise character of the planned CEPABs.
- No attempt should be made yet to rear *Copidosoma* parasitoids in Project-supported CEPABs, as several key issues regarding their potential role in the management of potato tuber moth populations remain unresolved at the time of this evaluation.
- All CEPAB personnel should receive adequate training and technical assistance from qualified CIP staff, including periodic visits designed to ensure that adequate quality standards are maintained.
- To the extent possible, CIP should monitor and periodically examine the field effectiveness of baculovirus produced with Project support.
- During the next 1.5 years MIPANDES should encourage and support the CEPAB concept and test their social, economic and technical viability at the community level. If the CEPAB concept is viable, MIPANDES should promote their multiplication based on demand, access to users, and production unit size. As 1.5 years may not be sufficient to fully test the viability of the CEPAB concept, CARE should seek to extend this activity for another two years to ensure that it is given a reasonable time frame to demonstrate its potential to succeed (also, refer to section 6.8).

6.5 CARE-CIP Relationships

- Both institutions should conduct a lessons learned analysis of the joint venture initiative, including its technical, managerial and institutional aspects. This exercise may be used to plan future strategies for collaborative work and to develop a proposal for the continuation and/or expansion of MIPANDES.
- As long as there is a clear understanding of the risks involved, there is no need for formal management structures for MIPANDES. The project, however, could take

advantages of the experiences being developed through improved technical coordination. One national Project meeting and one or two regional meetings per year, to be attended by CARE and CIP staff, should be conducted in order to share experiences and information, standardize criteria on technical issues, evaluate Project activities and progress and assess training needs for project personnel.

- CARE should create a suitable mechanism for field visits by CIP staff in order to maximize their productivity and interactions with MIPANDES extensionists. At the end of each visit, the CIP-CARE team should review and analyze the results and write a short report, outlining main findings and recommendations.
- Since CIP staff cannot extend the time devoted to outreach activities, if MIPANDES is to expand or replicate, CARE will need to increase its multiplication capacity and efficiency by using some of its best qualified extensionists as "in house" experts to multiply training and technical assistance (see 1.1.1).
- Based on anticipated MIPANDES successes, CIP should consider demonstrating to the Project donor (also a CGIRC donor) the advantages of its enhanced outreach capabilities, through its joint venture with CARE, for achieving measurable impact in the field.

6.6 Women Participation

- MIPANDES should continue to encourage the participation of women in all aspects Project activities, including community/business management, operation of the planned CEPABs, and IPM training activities. To the extent possible, MIPANDES should also encourage qualified women to apply for CARE extensionist positions.

6.7 MIPANDES Implementation and Relationships with other CARE Projects

- Since IPM relies mainly on concepts and ideas, and much less on recipes or tools, its transfer demands more time than other traditional agricultural technologies. Therefore, extensionists need to spend more time with their communities, and to accomplish this a reduction in the number of communities serviced per extensionist is recommended. The work load calculation should be made based on number of households, rather than on number of communities per extensionist. The project should involve the community agricultural committees in disseminating IPM practices. MIPANDES should promote greater exchange of IPM experiences among community members and communities. This process could be monitored through a random selection of individual plots, which should vary during the year.
- Data collection under MIPANDES should be computerized to facilitate processing and analysis. Efforts should be made to analyze available data, being collected through the M&E system, in order to evaluate the contribution of activities and targets to the

final and intermediate project objectives. In this regard, Project Representatives could play an important role, analyzing and interpreting the data so as to make recommendations to CARE management regarding Project direction.

- The project should use the data generated through its M&E system for information and promotion purposes, through publications, videos, and other means. The original idea, later cancelled, of a video for the promotion of project results and achievements should be revived. Decision makers and donors need to be informed and convinced of the advantages and feasibility of successful IPM programs.

6.8 MIPANDES Sustainability and Future Expansion

- Given the present gains in the training area and barring any major invalidation of logframe assumptions, it is anticipated that in the 1.5 years left in the life of the project, MIPANDES will come close to attaining its expressed goal. However, although at the end on its third year, MIPANDES will probably demonstrate that it has indeed reached its targets, there is a risk in assuming that truly long-lasting adoption of IPM menu and safe pesticide use practices, as well as the long-term viability of CEPAB, has been achieved in the project implementation areas. CARE should consider continuing the MIPANDES Project for at least another two years to consolidate the gains and experiences of its first three years, to continue perfecting its training and extension methodologies, to further strengthen the IPM experience and technical capacity of its extensionists, and to capitalize on its recently acquired IPM expertise by tackling new crop protection challenges. The new phase or project would not merely be the continuation of all ongoing activities. Rather, it would selectively support aspects of the current activities, primarily for reinforcement purposes, while expanding others (e.g. CEPABs), and adding new ones (see below).
- At the community level, project sustainability will be a function of the sustainability of host projects, which can readily incorporate and continue the IPM component. The projects, however, need to do more work on community organization, strengthening them in their production techniques and entrepreneurial skills. This will be particularly essential for the sustainability of the CEPABs and necessary for other MIPANDES activities.
- CARE should continue to develop and even expand its emerging role, under MIPANDES, as a center of expertise in the transfer of IPM technology to poor farmers. Examples of areas that could be targeted for future expansion after the end of MIPANDES' third year include:
 - a. extending IPM approaches to the remainder of families participating in CARE programs, but not already included under MIPANDES,
 - b. extending IPM approaches through another institution,

- c. expanding the role of CEPABs through greater production levels and coverage.
- d. adding to MIPANDES' target pests major diseases such as potato late blight, *Phytophthora infestans* and bacterial wilt, *Pseudomonas solanacearum*.
- e. using the MIPANDES strategy and experience to help launch an IPM program for *Tesia solanivora*, were this species of tuber moth (now in Colombia) to reach the Peruvian Andes.

In addition, CARE should explore the possibility of adapting the MIPANDES model to other development needs, where it may effectively function as an extension agency and a natural link between a research organization and beneficiary families.

- To help ensure the continuation of ongoing MIPANDES efforts at the end of its third year, CARE should continue promoting the adoption of IPM by beneficiary farmers, in communal and individual farm plots, within its parent projects. In addition, CARE should continue providing IPM training to its extensionists, using IPM specialist from CIP and selected universities, as well as experienced CARE staff as trainers. CARE should develop a strategy for the full incorporation of MIPANDES activities into the parent projects before the end of the third year.
- CARE should continue exploring options for establishing linkages with institutions, such as PRONAMACHCS, which may be instrumental in further extending IPM to a larger population of beneficiary families. It should be kept in mind, however, that such relationships will lead to new demands on CARE staff, in the form of training and technical assistance. The association with PRONAMACHCS is more oriented to project expansion than to sustaining project interventions. CARE should carefully analyze the potential demands on MIPANDES for technical assistance before proceeding further with this association. Meanwhile, the ALTURA project representative and PRONAMACHCS' Agricultural Development Coordinator should be trained to be the technical support on IPM for PRONAMACHCS.
- At present, there is no assurance that the planned CEPABs will indeed be sustainable once Project support ends. CARE should understand that the two CEPABs will constitute a pilot activity that will require much MIPANDES commitment and support during the remaining 1.5 years of Project life. Both production centers will require a great deal of technical assistance and supervision by CIP personnel. If these promise to be socially, economically and technically viable MIPANDES should consider a second phase of two years to support the installation of more community run CEPABs to satisfy the demand for biocontrol agents developed by the project. This second phase should include the provision of infrastructure and equipment for the CEPABs, training for community members on the production and marketing of biocontrol agents, and training for extensionists on appropriate use of biocontrol agents. If at the end of the second phase the concept proves to be not viable, MIPANDES should

identify reliable sources of baculovirus and *Beauveria* (SENASA, INIA, CEDEP, etc.) and the means to make these agents available to local communities.

- Project expansion will need additional funding and could take various forms. It could be based on a renewed joint venture with limited involvement of CIP, on CARE's own initiative, or on CARE's associations with other local organizations. A renewed association between CIP and CARE will increase the impact of both organizations in the field and could serve as a model for the consolidation of this type of partnership. Donors will be looking forward to this option. CARE's association with other organizations (PRONAMACHCS, CEDEP) will be highly desirable but should be based on a clear analysis of efficiency and stability of the organizations, competitive advantages of each, and clear definition of roles.

7.0 Lessons Learned

The viability, cost-effectiveness, and potential for success of a technology transfer project, such as MIPANDES, increases significantly when it is designed to complement and be readily incorporated into existing projects which have a cadre of extensionists already working with a well-defined population of beneficiary farmers.

The potential effectiveness of an IPM extension program also depends significantly on the seriousness of the pest problems that the project is addressing and the availability of existing IPM technologies. In this case, both the weevil and the tuber moth were definitely perceived by farmers as both highly damaging and hard to control. At the same time, a set of IPM techniques, developed and validated by CIP, was available for immediate application.

When attempting to introduce technologies like IPM, which are based on the acquisition of new knowledge and which require that old ideas be modified or discarded, it is essential to invest considerable time and effort to demonstrate the concepts and techniques through various mechanisms. MIPANDES has applied this concept successfully by encouraging farmers to collect, rear, and observe target pest insects, in addition to using a variety of didactic and extension materials.

NGOs are becoming increasingly active in the transfer of IPM to small subsistence farmers in developing nations, thus filling a void that has never been adequately addressed by public sector extension systems. In the past, grassroots NGOs have tended to operate in isolation, and few have established strong linkages with universities, research centers, and other technology generating organizations. As a result, NGOs have missed the advantages of having ready access to cutting edge technology and qualified specialists. By establishing a creative partnership with CIP, CARE has been able to strengthen its capacity in IPM and to embark in what promises to be a successful project that reflects the comparative strengths and advantages of both institutions.

8.0 LITERATURE CONSULTED

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APPENDIX I

TOR PARA LA EVALUACION DE MEDIO CAMINO

TERMINOS DE REFERENCIA (TOR)

EVALUACION INTERMEDIA

PROYECTO MANEJO INTEGRADO DE PLAGAS PARA COMUNIDADES ANDINAS (MIPANDES)

CARE-PERU: Proyecto Manejo Integrado de Plagas
para Comunidades Andinas
(MIPANDES)

TORs Preparados por: Angel Chiri, Leader del Equipo de Evaluación

TORs Preparados en: Mayo de 1995

Persona Contacto: Francesco Boeren
Gerente de ARN, CARE-Perú

Ciclo de Financiamiento del Proyecto: Octubre 1993-Octubre 1996

Financiamiento: USAID, CARE-USA

I. INTRODUCCION

El SOW preparado para el Asesor Técnico Regional para América Latina y El Caribe en Agricultura y Recursos Naturales de CARE al momento de la elaboración del Plan Operativo Multianual del Proyecto de Manejo Integrado de Plagas para Comunidades Andinas (MIPANDES), en septiembre de 1993, incluyó la preparación de los Términos de Referencia (TORs) para las evaluaciones de medio camino y finales del Proyecto MIPANDES. Los TORs aquí presentados han sido escritos como documento base para la preparación de la evaluación de medio camino (18 meses), bajo el entendido que dichos TORs podrán ser modificados en la medida en que el Proyecto MIPANDES es ejecutado.

La propuesta metodológica para las evaluaciones de medio camino y final del Proyecto se basa en la estrategia del Proyecto que planifica iniciar actividades, durante el primer año, de educación sobre la identificación y el ciclo de vida de las plagas acompañadas por capacitación en el uso adecuado de plaguicidas. La introducción de prácticas MIP así como el inicio de la implementación de los Centros Comunales de Producción de Agentes de

Control Biológico (CEPABs) se planifican para el segundo año de intervenciones. De acuerdo a esta planificación, la evaluación de medio camino se concentra en medir conocimientos de los agricultores sobre las plagas, los plaguicidas y el MIP, actitudes de los miembros de la comunidad sobre plagas, plaguicidas y MIP y la adopción de algunas prácticas de uso seguro de plaguicidas. La evaluación final del Proyecto deberá concentrarse en medir la adopción de prácticas de uso seguro de plaguicidas, de MIP y de producción y distribución de los agentes de control biológico, actitudes sobre plaguicidas y plagas y el logro de los objetivos del Proyecto (ver Matriz de Evaluación en Anexo).

II. ANTECEDENTES GENERALES

A. CARE

Desde mediados de los ochenta, CARE, a través de sus Proyectos de Agricultura y Recursos Naturales, ha contribuido a solucionar muchos de los problemas que afectan a la agricultura del Perú: bajos rendimientos, desastres climáticos, ausencia de crédito rural y de conocimiento técnico a nivel de los agricultores pequeños y medianos. CARE ha estado involucrado en el trabajo de alivio de emergencias y en actividades de desarrollo en el Perú desde su respuesta al mundialmente conocido terremoto de 1970 en Huaraz, que sepultó a una ciudad entera en materia de segundos.

Los esfuerzos de desarrollo de CARE-Perú están agrupados en cuatro principales sectores: Agricultura y Recursos Naturales; Salud y Población; Apoyo Alimentario y Nutrición; y Desarrollo de Pequeñas Actividades Económicas. En la actualidad, CARE Perú opera en 14 sub-sedes, además de la sede principal de Lima, con 7 funcionarios internacionales y cerca de 450 miembros nacionales del personal. La misión implementa actualmente 24 proyectos en los cuatro sectores programáticos y tiene un presupuesto para el AF 1993 de \$17 millones, el tercero mayor de las casi 60 oficinas de CARE en el mundo.

CARE trabaja en estrecha cooperación con agricultores individuales, organizados en comunidades campesinas o grupos de pequeños productores, con organizaciones no gubernamentales (ONGs) locales, y con ministerios de agricultura de 50 países para ayudar a los pobres a manejar los escasos recursos y de esta manera mejorar su estándar de vida. Durante los últimos cinco años, CARE ha tenido como objetivo la reducción del uso de plaguicidas como contribución importante a la sostenibilidad de la producción agrícola. CARE fue la primera agencia no gubernamental de desarrollo en adoptar una Política de Plaguicidas y tiene un programa altamente exitoso de MIP en Nicaragua, en donde se ha reducido el uso de plaguicidas entre los agricultores participantes en un 84%. Ambos sirven como modelos para otras agencias internacionales y organizaciones no-

gubernamentales. Asimismo, en Sri Lanka, Bangladesh y en Centro América, se están revisando proyectos que expandirán vastamente el trabajo de CARE en MIP.

B. PERU

La región montañosa andina peruana ha sido tradicionalmente descuidada ya que el desarrollo del Perú se ha centrado alrededor de Lima y la región costera, más poblada. La gran mayoría de los pequeños agricultores andinos utilizan tecnologías tradicionales que son adecuadas para su subsistencia, pero resultan limitadas cuando se apunta hacia un incremento sostenido de la producción. El cultivo de la papa, que es uno de los principales cultivos alimenticio para altitudes que van de 1,000 a 4,200 metros, es crucial para la supervivencia de las comunidades andinas de subsistencia. Los rendimientos de papa en los Andes --lugar de origen de la papa-- están entre los más bajos del mundo. Esta baja productividad es el resultado combinado de condiciones climáticas adversas, baja calidad genética de la semilla del tubérculo, falta de capital para comprar fertilizantes, y pérdidas significativas de producción causadas por enfermedades fungosas y plagas insectiles. Toda esta problemática lleva a colocar al campesino andino en el fondo de la escala de pobreza del Perú, ya que las estadísticas revelan que el 47% de esta población no es capaz de satisfacer sus requerimientos mínimos de alimento.

III. ANTECEDENTES DEL PROYECTO A SER EVALUADO

Un problema significativo para los pequeños productores de papa de la Sierra y el Altiplano peruano, es la creciente pérdida de producción causada por el ataque de las plagas insectiles al cultivo, así como el creciente gasto en plaguicidas que los productores deben realizar para controlarlas. Entre las plagas insectiles más perjudiciales a la papa se encuentran el gorgojo de los Andes (*Premnotrypes latithorax*, *P. sutiricallus* y *P. vorax*) y la polilla de la papa (*Phthorimaea operculella*, *Symmetrischema plaesiosema* y *Eurysaca melanocampta*), las cuales causan pérdidas en producción entre 40 y 60% de las cosechas. El Centro Internacional de la Papa (CIP) ha conducido, por muchos años, investigaciones a nivel de laboratorio, invernadero y campo sobre las dos plagas principales que afectan este cultivo, y ha generado tecnologías que ya se encuentran listas para ser transferidas a los agricultores andinos.

El Proyecto de Manejo Integrado de Plagas para Comunidades Andinas (MIPANDES), ejecutado en los departamentos de Cajamarca, La Libertad, Ancash, y Puno, se basa en más de 15 años de experiencia técnica de campo en las áreas de agricultura y recursos naturales por parte de CARE-Perú, y en los 8 años de diligente investigación en MIP de la papa por parte del CIP.

El **Objetivo Final** del Proyecto es que, para 1996, 3500 familias que actualmente viven a niveles de subsistencia en 114 comunidades serranas del Perú hayan incrementado su disponibilidad de alimentos

y su ingreso familiar a través de una reducción sustancial de las pérdidas físicas y monetarias causadas por el gorgojo de los andes y la polilla de la papa.

El proyecto MIPANDES trabaja con campesinos con los **Objetivos Intermedios** de:

1. Capacitarlos en la identificación de plagas e insectos benéficos y en los aspectos biológicos más importantes, tales como el ciclo de vida de las plagas insectiles clave del cultivo de la papa;
2. Promover cambios de actitud y adopción de prácticas de reducción y *uso seguro de los plaguicidas*.
3. Introducir prácticas de manejo integrado de plagas, enfatizando la promoción de medios no químicos de control de las plagas agrícolas; y
4. Establecer Centros de Producción de Agentes de Control Biológico (CEPAB) de las plagas agrícolas, manejados por las propias comunidades.

Las principales estrategias del proyecto para lograr sus objetivos son:

- a) La educación de las comunidades campesinas en los aspectos biológicos relevantes para una comprensión de la dinámica poblacional de las plagas y de sus ciclos de vida, y las consecuencias de ello para afrontar su control.
- b) La capacitación de las comunidades objetivo del Proyecto en el uso adecuado de los plaguicidas agrícolas, incluyendo los aspectos de selección, manipuleo, aplicación, protección individual, almacenamiento, primeros auxilios etc.
- c) La extensión dirigida a introducir el concepto de Manejo Integrado de Plagas en las comunidades participantes, de 4 proyectos andinos de CARE, a través de la oferta de un "menú" de prácticas de MIP opcionales (prácticas de control integrado desarrolladas por el CIP), lo cual a su vez implica el desarrollo de una mayor capacidad decisoria por parte del agricultor en su enfrentamiento con las plagas.
- d) La promoción de la organización comunitaria para el manejo de los centros de producción de agentes de control biológico, para asegurar la sostenibilidad de las prácticas introducidas.

Cuatro de los proyectos multi-anales del Sector de Agricultura y Recursos Naturales de CARE --que constituyen la población objetivo para el Proyecto MIPANDES-- implementan actividades para mejorar

la infraestructura agrícola clave, la producción animal, y las técnicas de cultivo con las comunidades. Estos proyectos son el Proyecto Norandino de Desarrollo Agrícola (ANDES) en Cajamarca y La Libertad; el proyecto CHAVIN en Ancash; y los Proyectos Waru Waru y de Seguridad Alimentaria Surandina (SAAP) en Puno. El Proyecto MIPANDES traslapará con estos proyectos de CARE ya en ejecución.

En el Proyecto MIPANDES se propone que los grupos de pequeños agricultores garanticen una significativa participación y manejo de las actividades del proyecto por parte de las mujeres. Las responsabilidades tradicionales de las mujeres rurales en la selección y almacenamiento de semilla, y su participación global en la campaña de cultivo se verán reforzadas por este proyecto. Adicionalmente, se prevé un rol particular de las mujeres en la producción de agentes biológicos de control de plagas y en el manejo de los centros de producción. Este énfasis en las mujeres es especialmente importante ya que, debido a la migración de los varones a las ciudades en busca de trabajo, más y más viviendas rurales están siendo encabezadas por mujeres.

El Proyecto MIPANDES inicia sus actividades con la firma del convenio de cooperación entre la AID y CARE durante el mes de septiembre de 1993.

IV. PROPOSITO Y OBJETIVOS DE LA EVALUACION

Los **propósitos de la evaluación** intermedia del Proyecto MIPANDES son el de proveer a los niveles gerenciales de CARE-Perú con la información necesaria para:

- A) evaluar la marcha de la implementación del Proyecto, en función de la consecución de sus objetivos;
- B) proveer información para tomar decisiones en relación a posibles modificaciones en el diseño o implementación del Proyecto para asegurar un impacto positivo en las comunidades intervenidas.

Asimismo, esta evaluación proporcionará datos respecto a la disminución de plaguicidas usados que el Proyecto está logrando. Finalmente, la evaluación proporcionará al donante, USAID, información sobre la marcha del Proyecto: sus logros, problemas y posibles soluciones para asegurar la consecución de su objetivo final. La evaluación no sólo deberá considerar los lineamientos de CARE para las evaluaciones intermedias (ver CARE's Program Manual), sino también recabar información que permita determinar si el Proyecto está cumpliendo con los principios programáticos de CARE.

Los **objetivos de la evaluación** de medio camino del Proyecto MIPANDES son:

- A. Revisar el diseño del Proyecto para asegurarse que las actividades planificadas contribuyen a lograr los objetivos del proyecto.

B. Revisar y evaluar el progreso en la implementación general del Proyecto hacia el logro de sus metas, resultados esperados y objetivos, incluyendo las relaciones de MIPANDES con otros proyectos de CARE y las relaciones entre CARE y CIP.

C. Recomendar mejoras para la implementación del Proyecto, incluyendo los aspectos de sostenibilidad de las acciones después de los tres años.

V. TEMAS ESPECIFICOS PARA LA EVALUACION

A. DISEÑO DEL PROYECTO

1. Revisar la lógica del esquema del diseño original del Proyecto, presentada en la propuesta del Proyecto y en el Plan Operativo Multianual.

2. Revisar, documentar cambios y discutirlos, ocurridos durante la implementación del Proyecto desde el momento de su concepción (Documento Propuesta y Plan Operativo Multianual). Prover recomendaciones para adecuar el Proyecto frente a los cambios ocurridos en relación a los supuestos relacionados a la situación de las plagas, del cultivo, de las comunidades intervenidas y del país, en general.

B. IMPLEMENTACION

1. Revisar y evaluar el sistema de monitoreo del Proyecto, flujo y manejo de la información.

2. Evaluar la adecuación del personal técnico del Proyecto para las actividades programadas, tanto cuali como cuantitativamente.

3. Evaluar la participación de la mujer y niños en las actividades del Proyecto.

4. Evaluar las ventajas o desventajas de la integración del Proyecto MIPANDES con los otros Proyectos "madre" de CARE: Chavín, SAAP, ANDES y Waru-Waru.

5. Evaluar las ventajas de la asociación CARE-CIP para implementar este Proyecto, su funcionamiento en la práctica y hacer recomendaciones para mejorarla.

C. CAPACITACION Y EXTENSION

1. Evaluar los logros del Proyecto en los aspectos de la capacitación, tanto del personal técnico como de las comunidades participantes.

2. Revisar y evaluar la contribución del CIP a la capacitación de los técnicos de CARE. Dar recomendaciones para mejorarla.

D. CENTROS DE PRODUCCION DE AGENTES DE CONTROL BIOLÓGICO

1. Evaluar el proceso general de puesta en marcha de la producción de los Centros, principalmente revisando y discutiendo los aspectos técnicos del proceso de producción.

2. Evaluar lo adecuado del proceso de organización comunitaria necesaria para el manejo y gerencia de los Centros.

3. Evaluar la solidez económica de la propuesta de los Centros y su sostenibilidad financiera al futuro y hacer recomendar sobre posibles cambios al futuro.

4. Evaluar los aspectos anticipados de comercialización de los agentes biológicos y proveer recomendaciones para mejorarla.

5. Evaluar y recomendar sobre la incorporación de la cría de *Copidosoma* a nivel de los Centros Comunales de Producción de Agentes de Control Biológico, tanto desde el punto de vista técnico como económico.

6. Evaluar el papel potencial de la mujer en la gerencia y funcionamiento de los CEPABS.

E. RESULTADOS

1. Evaluar los avances de los participantes del Proyecto en sus conocimientos sobre biología de las plagas, MIP y manejo y uso de plaguicidas, en relación a la información disponible del Estudio de Base.

2. Evaluar el posible cambio de actitud de los participantes con respecto a su percepción de las plagas, de los plaguicidas y de los métodos para su manejo.

3. Evaluar la aceptabilidad, por parte de los agricultores, de las prácticas de MIP que el proyecto está promoviendo y discutir su adecuación al ambiente sociocultural y agroecológico en que el Proyecto está trabajando.

4. Evaluar, cuantitativamente, el logro de las metas planificadas y los resultados esperados.

5. Evaluar los logros principales en cuanto a adopción de prácticas de uso seguro de plaguicidas y, en menor medida, de MIP por parte de los participantes del Proyecto.

6. Con base en la información preliminar, disponible a medio camino de la implementación, discutir el significado de las posibles reducciones en pérdidas de producción y en el uso de plaguicidas a nivel de la economía familiar.

7. Estimar, proyectando hacia el final de la vida del Proyecto, el posible impacto potencial del Proyecto MIPANDES sobre la seguridad alimentaria y el ingreso de las comunidades participantes.

F. FUTURO Y SOSTENIBILIDAD

1. Evaluar la potencial sostenibilidad de las intervenciones técnicas, principalmente las prácticas recomendadas, del Proyecto al futuro, luego del tercer año.

2. Proveer recomendaciones sobre el futuro del Proyecto, luego de su tercer año, en cuanto a necesidades de continuidad en las intervenciones de CARE (financiamiento adicional para asegurar sostenibilidad), su posible expansión y replicabilidad.

3. Analizar y proveer recomendaciones sobre la viabilidad, técnica, económica y social, de los Centros de Producción de Agentes de Control Biológico, más allá de la vida del Proyecto.

VI. METODOLOGIA SUGERIDA

Los presentes TORs han sido preparados para facilitar y guiar el proceso de la evaluación de medio camino del Proyecto MIPANDES. La evaluación de medio camino se guiará por la metodología aceptada por CARE ya sea de referirla al cumplimiento de los objetivos y metas o a la elaboración de preguntas claves sobre el problema, los participantes, el proyecto y sus logros.

A. EQUIPO EVALUADOR

La evaluación deberá ser realizada por un equipo interdisciplinario, externo a CARE-Perú, integrado por: a) un especialista en control biológico y manejo integrado de plagas (líder del equipo); b) un especialista en MIP y transferencia de tecnología; c) un economista; adicionalmente, un funcionario de CARE-Perú, con especialidad en agro-economía se integrará al equipo de evaluación. Los miembros del equipo tienen amplia experiencia de trabajo en proyectos de desarrollo agrícola, conocimiento y algo de experiencia en ecosistemas andinos y dominan el idioma castellano.

B. DURACION

Se estima que un equipo de cuatro evaluadores requerirá un mínimo

de dos semanas a tres para completar el ejercicio de evaluación.

C. PREPARACION POR PARTE DE CARE-PERU

1. Programa. Un programa detallado y completo de la evaluación será preparado por CARE-Perú, anticipadamente a la llegada del equipo evaluador, para su consideración. El programa incluirá entrevistas con los participantes del proyecto (personal de CARE y de las comunidades), así como entrevistas con el personal del CIP, visitas a las áreas de intervención del proyecto y a la Misión de la AID en Perú. El personal del Proyecto deberá facilitar las visitas del equipo evaluador a los lugares programados.

2. Presentación. El Gerente del Sector ARN de CARE-Perú, asistido por los coordinadores de los proyectos Chavín, ANDES, Waru-Waru y SAAP, presentarán al equipo evaluador la historia de gestación, objetivos, inicio de implementación y los principales logros y problemas encontrados durante la implementación del Proyecto MIPANDES.

3. Documentación del Proyecto. CARE-Perú deberá poner a disposición del equipo evaluador todos los documentos generados por el proyecto MIPANDES, incluyendo la propuesta, los planes multianuales y anuales, PIRs, así como todos los materiales de capacitación, audiovisuales y otros producidos por el Proyecto dirigidos a extensionistas y a agricultores.

D. PREPARACION POR PARTE DE LOS EVALUADORES

El equipo evaluador deberá leer, antes del inicio de la evaluación, todos aquellos materiales relevantes, incluyendo como mínimo la Propuesta del Proyecto presentada a la USAID, el Plan Multianual 1993-6, los PIRs, así como los TORs para la evaluación de medio camino.

E. METODOLOGIA SUGERIDA

A los efectos de poder evaluar los principales componentes del Proyecto MIPANDES, extensión, capacitación y centros de producción, se sugiere una combinación de métodos cuali y cuantitativos con alta participación de los funcionarios de CARE y de las comunidades beneficiarias.

El equipo evaluador deberá generar las preguntas de la evaluación en función del esquema del Proyecto, o sea del problema que el Proyecto intenta resolver, de las causas identificadas y de las acciones (estrategia y actividades) que el Proyecto desarrolla. Las siguientes metodologías se sugieren para la evaluación de medio camino:

1. Revisión de datos. Los avances en cuanto al cumplimiento de los objetivos intermedios, de acuerdo a los indicadores claves, podrán ser evaluados cuantitativamente comparando las

cifras del diagnóstico de base, realizado al inicio de las actividades del Proyecto, con las reportadas a través de los sistemas de monitoreo y seguimiento del Proyecto durante su ejecución (PIRS). Asimismo, el cumplimiento de las metas del Proyecto podrá ser evaluado a partir de estos informes.

2. Revisión de documentos. La revisión de documentos del Proyecto (PIRS, informes anuales, materiales de difusión y de capacitación publicados, audiovisuales producidos, etc.) deberá proporcionar información sobre el cumplimiento de metas, avances y logros generales del Proyecto, tanto cuali como cuantitativamente.

3. Observaciones. Las visitas a las áreas de acción del Proyecto, observando sus parcelas demostrativas, los centros de producción de agentes de control biológico, las comunidades, y el accionar del personal técnico proveerá información sobre el relacionamiento del personal del Proyecto con las comunidades, su capacidad técnica, la receptividad del Proyecto a nivel de las comunidades y lo acertado de las tecnologías que están siendo promocionadas, así como de las metodologías utilizadas para lograrlo. El equipo evaluador deberá participar no sólo en visitas preparadas para la evaluación sino también en actividades normales (no programadas para la evaluación) del Proyecto.

4. Entrevistas. Reuniones el personal del Proyecto (a nivel gerencial y de campo), con miembros de las comunidades, contrapartes (oficiales o no), con científicos del CIP y otros. Las anteriores proporcionarán información, por un lado, sobre la aceptabilidad y reconocimiento del Proyecto, y por otra, sobre el nivel de conocimientos de los extensionistas y de los agricultores sobre las prácticas MIP y de manejo de plaguicidas.

F. PRESENTACION DE RESULTADOS Y RECOMENDACIONES

Finalizando el proceso de evaluación, el equipo evaluador deberá presentar los principales resultados y recomendaciones al equipo del Proyecto MIPANDES, eventualmente ampliado con otros miembros del Sector de ARN de CARE-Perú. En esta presentación se espera que los técnicos del Proyecto, y del Sector, reaccionen frente a los resultados y recomendaciones presentados y retroalimenten al Equipo Evaluador. Se espera que el Equipo Evaluador recoja los comentarios realizados durante esta presentación y los incorpore al Informe Final de la Evaluación.

Antes de finalizar sus funciones, el Equipo Evaluador deberá presentar un resumen de los principales resultados y recomendaciones a las autoridades de la Misión CARE-Perú (CD, ACDs, Gerente del Sector ARN). El líder de Equipo Evaluador será el responsable, frente a CARE-Perú, de entregar el Informe Final de la evaluación en el plazo y formato acordado al inicio de la evaluación.

APPENDIX II

EVALUACION INTERMEDIA PROYECTO MIPANDES CARE-PERU

AGENDA SEGUIDA POR EL EQUIPO EVALUADOR¹

Jueves, 18 Mayo

- am Llegada de Angel Chiri y Mario Pareja.
Reunión con CARE: Francesco Boeren y Sandy Laumark.

- pm Lectura de materiales.
Reunión A Chiri y M Pareja.
Noche en Lima.

Viernes, 19 Mayo

- am Reunión del equipo evaluador: A Chiri, M Pareja, H Fano, M Ordinola: definición de los TOR, SOW, preguntas claves por tema y agenda.

- pm Reunión con PRONAMCHS: Raúl Caro, Hugo Sobero, Jorge Maraví, Victor Soto.
Noche en Lima.

Sábado, 20 Mayo

- am/ Reunión: presentación general del Proyecto MIPANDES: F Boren y M Ordinola.

- pm Capacitación y materiales de extensión: videos, folletos, afiches, etc. Elia Luna/CARE.
Noche en Lima.

Domingo, 21 Mayo

- R & R
Noche en Lima.

Lunes, 22 Mayo

- am Reunión con USAID: Eddy Alarcon.
Reunión con SENASA: Luis Valdivieso.

- pm Reunión con CIP: Fernando Ezeta, Fausto Cisneros, Jesús Alcázar, María Palacios, Heber Torres.
Noche en Lima.

¹ Integrado por Angel Chiri (Leader), Mario Pareja, Hugo Fano y Miguel Ordinola.

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Martes, 23 Mayo

- am Viaje Lima - Puno.
Reunión con Victor León.

- pm Visita a cuatro comunidades del área de Puno con V León,
Zacarías Cutipa y Julio César Castro.
Cena-reunión con V León, Z Cutipa y JC Castro.
Noche en Puno.

Miércoles, 24 Mayo

- am Reunión con SERESA: Flavio Calcino.
Visita al CIPIBE, Universidad Nacional del Altiplano:
Eulogio Sanabria.
- pm Visita a tres comunidades del área de Puno con V León, JC
Castro y Z Cutipa.
Reunión con PRONAMACHCS: y José Lencina.
Noche en Puno.

Jueves, 25 Mayo

- am Revisión de información en la oficina de CARE en Puno.
Visita al laboratorio de cría de *Copidosoma* del INIA:
Noemí Vejar.

- pm Regreso a Lima
Redacción del informe.
Noche en Lima.

Viernes, 26 de Mayo

- am/ Grupo 1²: Viaje Lima - Cajamarca
- pm Visita al área de Cajamarca.
Noche en Cajamarca.

- Grupo 2: Viaje Lima - Huaráz.
Visita a dos comunidades del área de Ancash.
Reunión y visita centro de producción de
Trichograma del CEDEP: Miguel Orellana y
Rómulo Loaiza.
Noche en Huaráz.

Sábado, 27 Mayo.

- am Grupo 1: Visita al área de Cajamarca.
Grupo 2: Visita a dos comunidades del área de Ancash.

- pm Grupo 1: Viaje Trujillo - Lima.
Grupo 2: Viaje Huaráz - Lima.
Noche en Lima.

Domingo, 28 Mayo

- am/ Redacción del informe.
- pm

² Grupo 1: A Chiri y M Ordinola; Grupo 2: M Pareja y H Fano.

Lunes, 29 Mayo

am Redacción del informe.

pm Redacción del informe.
Reunión del equipo evaluador.

Martes, 30 Mayo

am Redacción del informe.

pm Reunión de trabajo con ARN/CARE-Perú y MIP/CIP.

Miércoles, 31 Mayo

am M Pareja sale del Perú.

am/ A Chiri, H Fano, M Ordinola: redacción del informe.

Jueves, 1 Junio

am Reunión final con USAID, CARE-Perú y CIP.

A Chiri sale del Perú.

Presentación de un esbozo del documento a CARE-Perú.

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APPENDIX 3

Hugo Fano
CIP

METODOLOGIA DE MEDICION DEL IMPACTO ECONOMICO Y SOCIAL:

Considerando que existe un adecuado record de actividades y resultados en los informes de Seguimiento y Monitoreo y teniendo en cuenta que en esta segunda parte del proyecto se realizarán actividades de capacitación en las prácticas MIP, se recomienda emplear los siguientes dos métodos de evaluación del impacto:

- Comparación "cross section" del con y sin: Muestreo, por extensionista, de 10 casos de familias involucradas en el Proyecto MIPANDES y de 10 casos de familias no involucradas en el proyecto.
- Comparación "trend" del antes y después: Muestreo, por extensionista, de 10 casos de familias involucradas en el Proyecto MIPANDES, tomando datos en Julio de 1995, para compararlos con datos a fines de 1996 (término del proyecto).

INFORMACION REQUERIDA PARA LA EVALUACION DEL IMPACTO:

Existen cuatro datos claves que deben ser completados: (1) tasas de difusión, (2) tasas de reducción de pérdidas por daño de las plagas, (3) ahorro de costos, y (4) incremento de los ingresos. Por consiguiente, se recomienda:

- Centralizar la información de adopción de prácticas para tener un registro resumen a Julio de 1995 (con y antes). Separar la información "adopción de práctica xx con" como tasa de difusión y la información "adopción de práctica xx sin" como tasa de irradiación.
- Realizar un muestreo, por extensionista, de 10 casos con y 10 casos sin sobre costos de producción, pérdidas por daño de cada una de las dos plagas y destinos de la producción sana y dañada, valoradas a precio de mercado o precios sociales. Esta información debe ser a nivel familiar y debe estar lista para Julio de 1995.
- Evaluar el aporte de cada práctica en la reducción del daño y en la reducción de la incidencia y presencia de la plaga (gorgojo o polilla).
- Contexto económico y social de la adopción de las prácticas MIP: No olvidar que la actual crisis económica, la falta de créditos agrarios y la casi inexistente asistencia técnica estatal son elementos claves que aportan en la búsqueda de alternativas de control de las plagas por parte de los agricultores y que por lo tanto influyen en la adopción de las prácticas MIP.

- Impacto social: Existen ciertos beneficios sociales no cuantificables que deben ser evaluados desde ahora y comparados con la situación al término del proyecto MIPANDES. Estos beneficios sociales se refieren a: la calidad del alimento (papa) y la calidad de vida de las familias: